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# SCIENCE

NEW YORK, JUNE 10, 1892.

## DIRECT REFLECTING POLARISCOPE.

POLARIZATION by reflection is more perfect than by transmission through thin plates, unless a large number of plates are used, and in that case there is difficulty in finding plates free from color. The disadvantages of reflection are (1) the "elbow" angle and (2) the impossibility of rotation of the polarized beam. Both these objections are overcome in the forms here described, which may be attached to the lantern by a sliding collar and rotated almost as easily as a Nicol.

In Fig. 1, *p* is a bundle of thin glass plates, set at the polarizing angle; *m* is a silvered mirror. Either the reflected

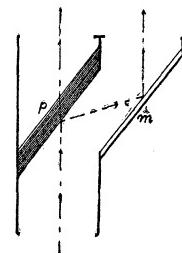


FIG. 1.

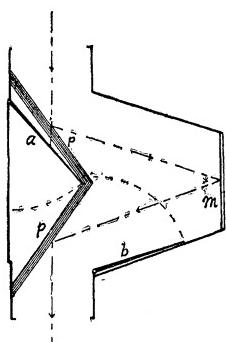


FIG. 3.

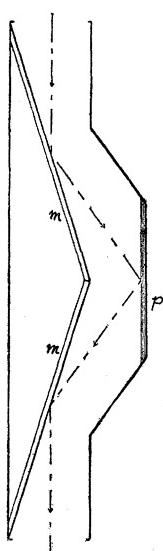


FIG. 2.

or the transmitted beam may be used; or, if the mirror is slightly movable, the two images may be thrown either side by side or superposed upon the screen.

In Fig. 2 the bundle of plates, *p*, has a black backing, and there are two silvered mirrors, *m*, *m*. The reflected beam only is used.

The form shown in Fig. 3 is more complicated and clumsy in appearance, but it has the advantage of keeping either the reflected or the transmitted beam, or both, in the axis of rotation. *a* and *b* are movable blackened screens.

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PROFESSOR A. S. HARDY of Dartmouth, who has been spoken of for president of the college, has decided to leave Hanover and take a new professorship at West Point.

## NOTES ON THE FERTILITY OF *PHYSA HETEROSTROPHA* SAY.<sup>1</sup>

ON the 8th of March, 1886, I collected from a marsh near Wake Forest two specimens of *Physha heterostropha* Say. On the 16th three thick nidamenta, of some forty eggs each, were seen loosely attached to the walls of the glass aquarium. A few days later four others had been deposited. Up to June 15 the aquarium was examined at intervals nearly every day. After that date it was not seen again until July 12, when the water was changed. The next day both the snails were dead, probably as the result of the change of water.

In the period of four months — say March 12 to July 12 — the pair produced 43 nidamenta, which contained, on an estimate certainly not too high, an average of 30 eggs each, so that the number of their offspring for the period mentioned amounted to 1,290. There was no well-marked decline of the reproductive function toward the close of the period, which is perhaps another indication that they came to their death by violence.

From March 31 to June 6 inclusive, the pair were observed in coitus as many as fifteen times, at hours ranging from 8.30 A.M. to 6.15 P.M., the coitus lasting sometimes but twenty minutes, sometimes more than an hour. The male function was performed alternately by the two snails. The eggs appear to have been laid only during the night.

It was important to determine, if possible, the age at which sexual maturity is attained and reproduction begins. Accordingly, on the 12th of July I took out of the aquarium two of the largest of the young snails and put them into another aquarium. They were presumably members of the first brood, the eggs of which were deposited near March 13. Their age, reckoning from the time they were hatched, was about  $3\frac{1}{2}$  months; size, length of shell, 5 millimetres; length of foot, 6 millimetres. In two days one of the snails was dead. On the 25th of July another snail of about the same size was introduced from the first aquarium. The next entry in my notes is under date of Sept. 11, when six nidamenta were observed attached to the fibrous roots of a water plant. They were, however, small, containing only from one to four eggs each, showing that the reproductive function at that age was feeble. Some of the eggs were already hatched, and the tiny grandchildren of my first *Physas* were going about the aquarium in search of food. Allowing, say, fifteen days for the intracapsular development of these snails of the third generation, I estimate that the isolated pair of the second generation attained sexual maturity at five months of age. The same day — Sept. 11 — in the first aquarium I noticed a confirmation of my observation in the second, namely, the pairing of two of the oldest brood.

The maintenance of a species depends on the equilibrium between the forces tending to its destruction and those tending to its preservation. We may embrace the former under the general phrase, adverse external conditions. There are two different ways in which the destructive tendency of these adverse external conditions is opposed. The first is by adap-

<sup>1</sup> Abstract of a paper read before the Elisha Mitchell Scientific Society in session at Wake Forest, . . , Oct. 28, 1891.